REGULATING REFRIGERATOR CAR HEATERS BY "INSIDE" TEMPERATURES:

A radio talk prepared by Earl D. Mallison, Office of Horticultural Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and delivered by John L. Harvey during the Western Farm and Home Hour, Thursday, September 1, 1932, through Station KGO and nine other stations associated with the NBC-KGO network, Pacific Division, National Broadcasting Company.

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ANNOUNCER (Nichols): We have learned many things from the Bureau of Plant Industry. From time to time we have had reports on various diseases which take their annual toll from our field and fruit crops. Last winter H. C. Diehl, senior physiologist for this Bureau, told us about his work in the Frozen-Pack Laboratory at Seattle. But we have by no means touched upon all of the problems being studied by this group of scientists and investigators. The possibilities in the saving of waste and loss in the storage and handling of fruits and vegetables have engaged their attention for a number of years. Earl D. Mallison, specialized investigator in problems relating to transportation of these perishable commodities, has a report for us on a test which was made last winter -- a test to determine an efficient way to operate refrigerator car heaters. Mr. Mallison cannot be with us -- the distance between Yakima, Washington, and San Francisco being considerable, as you know. But this situation can be at least partially remedied, if you will speak for him, Jack Harvey.

HARVEY: I'll be glad to, Bobb. In all of the transportation tests we have conducted, says Mr. Mallison, our aim has been to discover practical ways of handling fruits and vegetables in transit so that in spite of their perishable nature they will reach market in good condition. We -- I use the plural for there are others making these transportation tests besides myself -- ride freight trains as a profession and not as a pastime. The "side-door pullman" becomes our laboratory as we make many of our tests while the produce is on its way to eastern markets. In the summer, we run tests on car refrigeration; in the winter, on car heating, our objective all the time being to improve existing handling practices.

Speaking of objectives, mine in this discussion is to tell you about a test which we made on a trainload of fruit being shipped from Wenatchee to New York City last February. Our purpose was to obtain the facts about the possibility of operating car heaters on the basis of temperatures inside the refrigerator car rather than on the basis of outside aid temperatures. The latter is the standard railroad practice under the Carriers' Protective Service. Off hand, this distinction seems of small consequence. But wait a minute before you leap to conclusions: First, consider why refrigerator cars are heated. To keep the fruit or vegetables in the car from freezing, you say. All right. Now what happens if the heaters are not properly controlled.--if they are not extinguished soon after the temperature of the car rises above the freezing point? Why, you get much the same results as when you ship fruit, for example, during hot weather without refrigeration. Even moderately high temperatures inside the car hasten ripening and thus shorten the period during which the product can be stored upon arrival. The temperature range while the fruit is in transit has a direct bearing on the amount of decay present when the car is unloaded. Tem-

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peratures close to freezing greatly retard the development of the fungi causing this decay.

It follows then that the shorter the period the car heaters burn and yet keep the fruit from freezing, the better will be the condition on arrival at destination.

Now when you start to play around close to the freezing point with fruit, you must have means of determining accurately and quickly its temperature. That is why we believed thermometers placed inside the cars would be better than the present method of going by outside temperatures.

You see under the present rules governing heater service, all cars of fruit in a train are handled in the same way. The heaters in the front bunkers of all cars are kept burning when outside temperatures are below 10 degrees, Fahrenheit. When the outside air temperature drops to 5 degrees below zero, then the heaters in rear bunkers are also lighted. Obviously, such a method of regulating the lighting of heaters does not take into consideration the difference between heaters of the same type, difference between temperatures in the cars just after the fruit is loaded; nor any of the varying weather conditions.

We have found in tests conducted in past years that difference in types of heater or in individual heaters of the same type may account for a difference of ten degrees or more in fruit temperatures at comparable positions in two cars.

In one of the tests made during 1931, outside air temperatures were for the most part just above 10 degrees F. for a considerable period of time. As a result no heaters were lighted, although the records for this test showed that the temperature of the fruit in the bottom layer of the cars went below the freezing point. In a test made from January 4 to January 15, 1928, we found that when atmospheric temperatures went below 10 degrees F. for only a short time there was no need of lighting the heaters. In another test made January 23 to February 1, 1928, we discovered that governing the operation of heaters by temperatures inside the cars resulted in 40 per cent less burning of the heaters and still gave sufficient protection against freezing.

The use of "inside control" is not new. Several years ago, some of the carriers experimented with thermometers inserted into the fruit at the bottom of the car doorways. The thermometers could not be read, however, except by opening the doors. The practice apparently did not give satisfaction, for it was finally discontinued.

We believe the use of suitable instruments that will permit the rapid reading of temperatures in the car without opening the doors should prove more satisfactory. In fact, in the test which I supervised last February we experimented with four types of special instruments which could be read from outside the cars. Our electrical resistance thermometers and bimetallic thermostats proved to be the most satisfactory. In case you don't recognize the type of thermometer I am referring to, I will describe it. These thermometers indicate temperature changes by variations in the resistance of a wire which is located at the point where the temperature is to be obtained. By means of a Wheatstone bridge, the resistance to the passage of an electric current through this wire is measured. As the change in the resistance is proportional to change in temperature of the wire, this resistance may be read in terms of temperature rather than in ohms of resistance. The leads from this type of thermometer extended out of the car at

the place where the doors came together and we could walk down one side of the train and read the temperature within the cars quickly and without opening the car doors.

The bimetallic thermostat is the same kind of a device as that used for regulating furnaces in dwelling houses and consists essentially of a bimetallic strip which makes contact with a metal point when the temperature goes below 29° or 30° F.

This February test confirmed our original surmise that the use of "inside control", that is, of using the temperatures inside the cars to determine when to light the heaters for protection against freezing, will give more satisfactory results than the present use of atmospheric temperatures for this purpose. Of course, it will necessitate an investment in instruments. But looking at this suggested expenditure from the viewpoint of the carriers, it is reasonable to suppose that suitable, practicable instruments will pay for themselves by saving heater fuel, by preventing damage to the quality and condition of the fruit and by furnishing information that would prevent the filing of unjust claims for damage because of freezing or overheating. "Inside control" cannot be expected to give the low temperatures of a cold storage, but the record of the tests I have discussed indicate that it is an improvement over present practices.

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